Section 4.1

Definition of Antiderivative: A function F is an antiderivative of f on an interval I when $F'(x) = f(x)$ for all x in I.

Power Rule for Integration

$$\int x^n dx = \frac{x^{n+1}}{n+1} + C, \quad n \neq -1$$

1) Solve the following differential equations.

   a) $y' = 2x$

   b) $\frac{dy}{dx} = \cos x$

2) Describe the antiderivatives of $2x^2$.

3) Find the following:

a) $\int \frac{3}{x^2} dx$

b) $\int 2\sqrt[3]{x}\, dx$

c) $\int \left(-\frac{1}{2}\csc^2 x\right) dx$

4) Find the following:

a) $\int (3 - x^2)\, dx$

b) $\int (2x^3 - 5x + 1)\, dx$

c) $\int \left(\frac{1}{3}x^4 + \frac{2}{5}x^2 - 3x\right) dx$

5) Find the following:

a) $\int \frac{2\sqrt{x}-3}{x^2}\,dx$

b) $\int x^2\left(\sqrt{x}-\sqrt[3]{x}\right)dx$

c) $\int \tan^2 x \csc^2 x\,dx$

6) Find the general solution of $F'(x)=\frac{1}{2}x^3$ and find the particular solution that satisfies the initial condition $F(2)=4$.

7) A cannonball is shot upward off a 224 foot cliff with an initial velocity of 80 feet per second.

a) Find the position function giving the height s as a function of the time t.

b) When does the ball hit the ground? How fast is it going when it hits the ground?

c) When does the ball reach its maximum height? What is the maximum height?

Homework for this section: Read the section and watch the videos/tutorials. Then do these problems in preparation for the quiz: #5, 9, 15, 21, 29, 37, 55